

LOICZ-Affiliated Activities

Boknis Eck Time Series Station

Overview

The Time Series Station Boknis Eck (BE) is located at the entrance of the Eckernförde Bay ($54^{\circ}31'N$, $10^{\circ}02'E$; water depth 28m, Fig. 1) in the south-western Baltic Sea. Sampling takes place monthly during a half-day trip to BE with R/V *Littorina* (Fig. 2-4). Samples are taken from six standard depths (1, 5, 10, 15, 20 and 25 m). The Boknis Eck Time Series Station was initiated by J. Krey of the former Institut für Meereskunde (IfM) in Kiel, Germany. The first measurements were performed on 30 April 1957. Salinity, temperature, and O₂ data from BE have been recorded on a monthly basis since April 1957 with only two major breaks (1976-78 and 1983-1985). Chlorophyll a measurements started in 1960 and nutrient data (NO₂-, NO₃-, NH₄⁺, PO₄³⁻, SiO₄²⁻) are available since March 1979. Routine trace gas measurements in the water column started in July 2005 (N₂O), June 2006 (CH₄) and February 2009 (DMS). Moreover the BE site is frequently used for non-routine project work (e.g. molecular biology, carbonate system, sediments, surface microlayer sampling). Additionally BE serves as an instrument test site.

The work at Boknis Eck Time Series Station is currently run by the Chemical Oceanography Research Unit of IFM-GEOMAR (see contact information below). During the last decades the work at BE was supported by various agencies such as DWK Meeresforschung (1957-1975), HELCOM (ECD and BMP from 1979 to 1995), BMBF (KBP, 1996-1999) and IfM (1999-2003). Past and ongoing individual projects using BE as sampling site were funded by 'Future Ocean' Kiel Cluster of Excellence, DFG, BMBF, EU, and others.



Hydrographic and biogeochemical settings

Riverine inputs are negligible in the Eckernförde Bay and thus the overall hydrographic setting at BE is representative for the southwestern Baltic Sea which is dominated by the regular inflow of North Sea water through the Kattegat and the Great Belt. Because the inflowing North Sea water has a higher salinity compared to Baltic Sea water, a pronounced summer stratification occurs which leads to the development of a pycnocline at about 15 m water depth. The seasonal stratification occurs from mid-March until mid-September. During this period, vertical mixing is restricted and bacterial decomposition of organic material in the deep layer causes pronounced hypoxia and sporadically occurring anoxia during late summer. Pronounced phytoplankton blooms occur regularly in autumn (September-November) and spring (February/March) and to a lesser extent during summer (July/August). The autumn and spring blooms are followed by

pronounced sedimentation of organic material. The summer blooms can be associated with a short period of pronounced sedimentation as well, however, sedimentation during the summer months is generally lower. In general, the duration and actual O₂ concentrations of hypoxia/anoxia have profound influences on both the ecosystem and biogeochemical cycles at BE. This is especially important in view of the fact that the microbial processes leading to the formation of climate-relevant trace gas such as nitrous oxide (N₂O), methane (CH₄) and dimethyl sulfide (DMS) are strongly influenced



Fig. 4: Surface microlayer sampling at Boknis Eck, June 2010. (Photo M. Krumbholz, IFM-GEOMAR)



Fig. 2: R/V Littorina on her way to the Boknis Eck Time Series Station.

(Photo A. Villwock, IFM-GEOMAR)

by the prevailing O₂ concentrations in the water column as well as in the sediments. Thus BE seems to be an ideal place to study the effect of hypoxia/anoxia on trace gas formation and emission. Moreover, BE as part of the Eckernförde Bay is well known for its 'gassy' sediments which are sites of enormous accumulation of sedimentary CH₄.

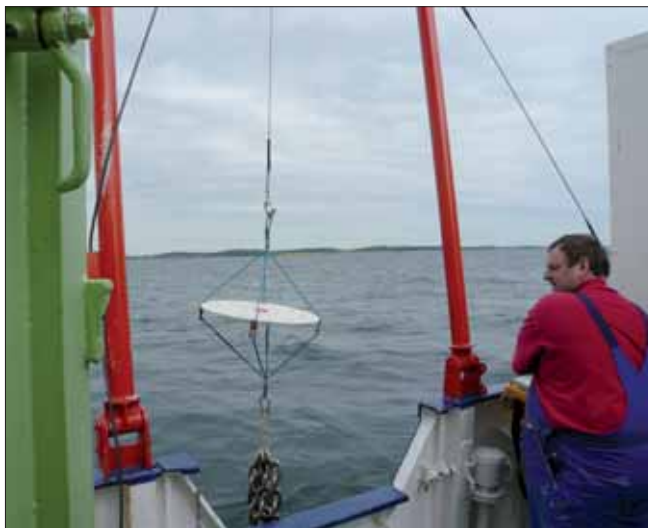


Fig. 3: Deployment of Secchi disk at Boknis Eck, June 2010.
(Photo M. Krumbholz, IFM-GEOMAR)

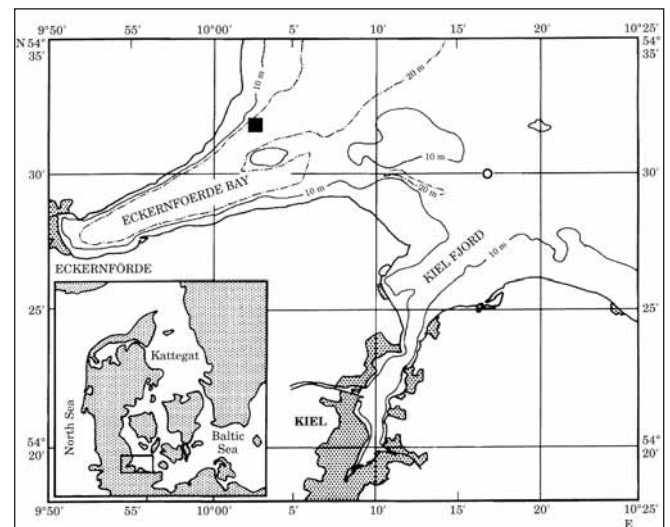


Fig. 1: Location (black square) of the Time Series Station Boknis Eck.
(Map H.P. Hansen, IFM-GEOMAR)

Selected publications with results from Boknis Eck.

Bange, H.W. et al. (2010):

Dissolved methane during hypoxic events at the Boknis Eck Time Series Station (Eckernförde Bay, SW Baltic Sea). *Biogeochemistry* 7: 1279-1284.

Hansen, H.P. et al. (1999):

Seasonal and long-term control of bottom water oxygen deficiency in a stratified shallow-coastal system. *ICES J. Mar. Sci. Suppl.* 56: 65-71.

Kremling, K. et al. (1997):

Variability of dissolved and particulate trace metals in the Kiel and Mecklenburg Bights of the Baltic Sea 1990-1992. *Marine Pollution Bulletin* 34: 112-122.

Richardson, M.D. & Davis, A.M. (1998):

Modeling methane-rich sediments of Eckernförde Bay. *Continental Shelf Research* 18: 1671-1688.

Schweiger, B. et al. (2007):

A time series of hydroxylamine (NH₂OH) in the southwestern Baltic Sea. *Geophysical Research Letters* 34, L24608, doi:10.1029/2007GL031086.

Smetacek, V. (1985):

The annual cycle of Kiel Bight plankton: A long-term analysis. *Estuaries* 8: 145-157.

Treude, T. et al. (2005):

Environmental control on anaerobic oxidation of methane in gassy sediments of Eckernförde Bay (German Baltic). *Limnology and Oceanography* 50: 1771-1786.

Wasmund, N. et al. (2008):

100-years changes in the phytoplankton community of Kiel Bight (Baltic Sea). *Journal of Marine Systems* 73: 300-322.

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Further information on Boknis Eck Time Series Station is available on the project's website (in German, English version will follow soon):

<http://www.ifm-geomar.de/index.php?id=bokniseck>

Please read more detailed information about the Boknis Eck Time Series Station in the upcoming volume of LOICZ inprint.



Read more about:

“Boknis Eck Time Series Station” in LOICZ INPRINT 2011/1

